3(2H)-Isothiazolone, 5-chloro-2-methyl-: Human health tier II assessment

08 March 2019

CAS Number: 26172-55-4

Preface

This assessment was carried out by staff of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) using the Inventory Multi-tiered Assessment and Prioritisation (IMAP) framework.

The IMAP framework addresses the human health and environmental impacts of previously unassessed industrial chemicals listed on the Australian Inventory of Chemical Substances (the Inventory).

The framework was developed with significant input from stakeholders and provides a more rapid, flexible and transparent approach for the assessment of chemicals listed on the Inventory.

Stage One of the implementation of this framework, which lasted four years from 1 July 2012, examined 3000 chemicals meeting characteristics identified by stakeholders as needing priority assessment. This included chemicals for which NICNAS already held exposure information, chemicals identified as a concern or for which regulatory action had been taken overseas, and chemicals detected in international studies analysing chemicals present in babies' umbilical cord blood.

Stage Two of IMAP began in July 2016. We are continuing to assess chemicals on the Inventory, including chemicals identified as a concern for which action has been taken overseas and chemicals that can be rapidly identified and assessed by using Stage One information. We are also continuing to publish information for chemicals on the Inventory that pose a low risk to human health or the environment or both. This work provides efficiencies and enables us to identify higher risk chemicals requiring assessment.

The IMAP framework is a science and risk-based model designed to align the assessment effort with the human health and environmental impacts of chemicals. It has three tiers of assessment, with the assessment effort increasing with each tier. The Tier I assessment is a high throughput approach using tabulated electronic data. The Tier II assessment is an evaluation of risk on a substance-by-substance or chemical category-by-category basis. Tier III assessments are conducted to address specific concerns that could not be resolved during the Tier II assessment.

These assessments are carried out by staff employed by the Australian Government Department of Health and the Australian Government Department of the Environment and Energy. The human health and environment risk assessments are conducted and published separately, using information available at the time, and may be undertaken at different tiers.

This chemical or group of chemicals are being assessed at Tier II because the Tier I assessment indicated that it needed further investigation.

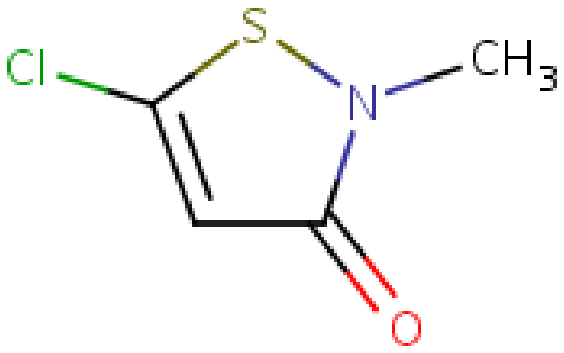
For more detail on this program please visit:www.nicnas.gov.au

Disclaimer

Acronyms & Abbreviations

Chemical Identity

Synonyms	5-Chloro-2-methyl-3-isothiazolone Methylchloroisothiazolinone (MCI) Isothiazolinone chloromethyl

Structural Formula	
Molecular Formula	C4H4ClNOS
Molecular Weight (g/mol)	149.45
Appearance and Odour (where available)	Clear to yellow liquid
SMILES	C1(=O)C=C(Cl)SN1C

Import, Manufacture and Use

Australian

No specific Australian use, import, or manufacturing information was reported for the chemical under previous voluntary and/or mandatory calls for information. The chemical is widely used in Australia as a preservative in cosmetic, personal care (including baby products), cleaning and laundry products. However, the chemical has now been reported to have domestic use as a preservative in paint formulations.

International

The following international uses have been identified through European Union Registration, Evaluation, Authorisation and Restriction of Chemicals (EU REACH) dossiers; the Organisation for Economic Cooperation and Development Screening Information Dataset Initial Assessment Report (OECD SIAR); Galleria Chemica; Substances and Preparations in the Nordic countries (SPIN) database; the European Commission Cosmetic Ingredients and Substances (CosIng) database; United States (US) Personal Care Product Council International Nomenclature of Cosmetic Ingredients (INCI) dictionary; and eChemPortal: OECD High Production Volume chemical program (OECD HPV), the US Environmental Protection Agency's Aggregated Computational Toxicology Resource (ACToR), and the US National Library of Medicine's Hazardous Substances Data Bank (HSDB).

The chemical has reported cosmetic use as a preservative in:

- baby products such as shampoos, soaps, detergents, bubble baths, lotions, oils, powders and creams, baby wipes;
- eye makeup such as eyeliners, removers;
- makeup blushers and face powders;
- fragrances;
- hair care products including conditioners, sprays/aerosol fixatives, straighteners, rinses, shampoos, tonics, dressings, and wave sets;
- hair colouring products (dyes and colours), bleaches, and tints;
- nail cream and lotion;
- underarm deodorants;
- aftershave lotions, shaving cream, shaving soap; and
- skin care products such as skin cleansing creams, lotions, powder and sprays, depilatories, face and neck creams, body and hand cream, moisturisers, night creams, paste masks/mud packs, skin fresheners, suntan gels, and indoor tanning preparations.

The chemical has reported domestic uses, including as preservatives in paints, lacquers and varnishes, and as ingredients in:

- adhesives, binding agents;
- anti-condensation agents;
- bleaching agents;
- cleaning/washing agents;
- colouring agents;
- corrosion inhibitors;
- fillers;
- flame retardants and extinguishing agents;
- odour agents;
- surface treatment;
- surface-active agents; and
- slimicides and fungicides with anti-mildew properties for leather, wood, pulp and paper products.

The chemical concentrations used in products are typically reported to be up to 0.1% in home maintenance and cleaning agents (US Department of Health and Human Services, Household Products Database) (HHPD).

The chemical has reported commercial use including in:

- absorbents and adsorbents;
- anti-set-off and anti-adhesive agents;
- anti-static agents;
- conductive agents;
- construction materials;
- cutting fluids;
- dust binding agents;
- friction agents;
- impregnation materials;
- photo chemicals;
- pH-regulation agents;
- process regulators;
- reprographic agents;
- softeners; and
- solvents.

The chemical has reported site-limited use including in:

- stabilisers;
- viscosity adjustors;
- complexing and flocculating agents;
- intermediates; and
- laboratory chemicals.

The following non-industrial uses have been identified internationally in:

- food/feedstuff flavourings and nutrients;
- non-agricultural pesticides and preservatives;
- pesticides, agricultural; and
- pharmaceuticals.

Restrictions

Australian

The chemical is listed in the *Poisons Standard—the Standard for the Uniform Scheduling of Medicines and Poisons* (SUSMP) in Schedule 6 (SUSMP, 2019). The following restrictions are based on the recommended changes to the Poisons Standard from the IMAP assessment published in Tranche 9.

METHYLCHLOROISOTHIAZOLINONE except:

a) in rinse off cosmetic preparations or therapeutic goods intended for topical rinse–off application containing 0.0015 per cent or less of methylchloroisothiazolinone and methylisothiazolinone in total; or

b) in other preparations that are not intended for direct application to the skin containing 0.1 per cent or less of methylchloroisothiazolinone and methylisothiazolinone in total.

Schedule 6 chemicals are described as 'Poison – Substances with a moderate potential for causing harm, the extent of which can be reduced through the use of distinctive packaging with strong warnings and safety directions on the label' (SUSMP, 2019).

International

The use of MCI/MI (CAS No. 55965-84-9), a 3:1 mixture of methylchloroisothiazolinone (MCI) and methylisothiazolinone (MI) is currently regulated in the EU with a maximum authorised mixture concentration of 0.0015 % (SCCS, 2009).

MCI/MI is currently permitted at levels =0.0015 % (15 µg/mL or 15 ppm) in rinse-off products and =0.00075 % (7.5 µg/mL or 7.5 ppm) in leave-on products (Health Canada, 2011).

The Expert Panel of the Cosmetic Ingredient Review (CIR) recommended a concentration of 15 ppm MCI/MI (76.7 % MCI and 23.3 % MI) for cosmetic rinse-off products and =7.5 ppm in cosmetic leave-on products (CIR, 1992).

Existing Work Health and Safety Controls

Hazard Classification

Methylchloroisothiazolinone is classified as hazardous with the following hazard categories and hazard statement for human health in the Hazardous Chemicals Information System (HCIS) (Safe Work Australia). This classification is based on the recommended amendment to the hazard classification in the HSIS (Hazardous Substance Information System–the Safe Work Australia online classification database at the time) from the IMAP assessment published in Tranche 9.

Acute toxicity – Category 3; H301 (Toxic if swallowed)

Acute toxicity – Category 3; H311 (Toxic in contact with skin)

Acute toxicity – Category 2; H330 (Fatal if inhaled)

Skin corrosion/irritation – Category 1B; H314 (Causes severe skin burns and eye damage)

Skin sensitisation – Category 1; H317 (May cause an allergic skin reaction)

The reaction mass of 3:1 of methylchloroisothiazolinone and methylisothiazolinone (3:1) (CAS No. 55965-84-9) is also classified with the following hazard categories and hazard statement for human health in the Hazardous Chemicals Information System (HCIS) (Safe Work Australia).

Acute toxicity – Category 3; H301 (Toxic if swallowed)

Acute toxicity – Category 3; H311 (Toxic in contact with skin)

Acute toxicity – Category 3; H331 (Toxic if inhaled)

Skin corrosion/irritation – Category 1B; H314 (Causes severe skin burns and eye damage)

Skin sensitisation – Category 1; H317 (May cause an allergic skin reaction)

Exposure Standards

Australian

No specific exposure standards are available.

International

The following exposure standards are identified (Galleria Chemica):

An exposure limit— TWA of 0.2 mg/m^3 and STEL of 0.4 mg/m^3 was identified in Switzerland.

Health Hazard Information

In this section, the health hazards of methylchloroisothiazolinone (MCI, CAS No. 26172-55-4) have been reported and, where data are not available, data on the analogues methylisothiazolinone (MI, CAS No. 2682-20-4) and 3:1 mixture of methylchloroisothiazolinone and methylisothiazolinone (MCI/MI, CAS No. 55965-84-9) were used in accordance with read-across principles (OECD, 2007).

Toxicokinetics

Toxicokinetic studies in rats using the chemical (CAS No. 26172-55-4) and its analogue (CAS No. 55965-84-9) show that it is readily absorbed and metabolised. The major metabolic products of the chemical are N-methylmalonamic acid (NMMA) and the 3-mercapturic acid conjugate of 3-thiomethyl-N-methyl-propionamide. These studies did not report accumulation of the chemical or its metabolites in tissues. The chemical is widely distributed to all tissues in the body, with the highest level in the liver and lowest in the bone. It is eliminated within 24 hours mainly through urine, followed by bile and, finally, faeces.

An in vitro human skin absorption study conducted in accordance with OECD Test Guideline (TG) 428 reported maximum potential systemic bioavailability of the chemical as 84.5 % of the applied dose (NICNASa; SCCS, 2009).

Acute Toxicity

Oral

Based on the available data, the chemical is recommended for classification as hazardous with the risk phrase ‘Toxic if swallowed’ (T; R25) in HSIS (Safe Work Australia).

The analogue (3:1 mixture of methylchloroisothiazolinone and methylisothiazolinone, MCI/MI—CAS No. 55965-84-9) had high acute toxicity in animal tests using oral exposure. Two studies where rats were administered the analogue chemical at 14 % reported the median lethal dose (LD50) at 64 mg/kg bw (69 mg/kg bw for male and 59 mg/kg bw for female rats). Observed sub-lethal effects included gastric irritation, lethargy and ataxia (CIR, 1992; SCCNFP, 2009).

Dermal

Based on the available data, the chemical is recommended for classification as hazardous with the risk phrase ‘Toxic in contact with skin’ (T; R24) in HSIS (Safe Work Australia).

The analogue chemical (MCI/MI, CAS No. 55965-84-9) had high acute toxicity in animal tests using dermal exposure. A study administered in rats using the analogue chemical as 14 % reported the LD50 at 141 mg/kg bw for both sexes. A similar study (administered as a 1.5 % formulation) in rabbits reported the LD50 as 113 mg/kg bw (CIR, 1992; SCCNFP, 2009).

Inhalation

Based on the available data, the chemical is recommended for classification as hazardous with the risk phrase ‘Very toxic by inhalation’ (T; R26) in HSIS (Safe Work Australia).

The analogue chemical (MCI/MI, CAS No. 55965-84-9) exhibited high acute toxicity in animal tests using inhalation exposure. The median lethal concentration (LC50) in rats after a four-hour aerosol exposure was reported as 0.17 mg/L (IUCLID, 2000). Another study in rats reported the LC50 as 0.33 mg/L after a four-hour aerosol exposure. The major signs of toxicity were marked dyspnoea, salivation and death, and the principal lesions included pulmonary congestion, oedema, and haemorrhages (CIR, 1992; SCCS, 2009).

Corrosion / Irritation

Skin Irritation

Based on the available data, the chemical is recommended for classification as hazardous with the risk phrase ‘Causes burns’ (R34) in HSIS (Safe Work Australia).

The analogue chemical (MCI/MI, CAS No. 55965-84-9) was found to be corrosive to rabbit skin when applied as a single semi-occluded application (at concentrations of 1.5 % and 14 %) to shaved intact skin of New Zealand White rabbits in several studies (CIR, 1992; IUCLID, 2000). No other details were specified.

Eye Irritation

The chemical is recommended for classification as corrosive. It is expected that the undiluted chemical would be severely damaging to the eyes.

The analogue chemical (MCI/MI, CAS No. 55965-84-9) was found to be corrosive to rabbit eyes in numerous Draize eye irritation studies using concentrations ranging from 1.1 % to 14 % (560–56,000 ppm). An aqueous dilution of 0.0056 % (56 ppm) was found non-irritating when tested in rabbit eyes for a period of four weeks (five days per week) (CIR, 1992).

The analogue chemical (CAS No. 55965-84-9) (undiluted) was also found to be an irritant in a bovine cornea study that measured opacity and permeability (CIR, 2010).

Sensitisation

Skin Sensitisation

The chemical is considered to be a skin sensitiser based on the positive results seen in several animal (guinea pig maximisation tests, Buehler test and local lymph node assays) and human studies.

In an in vitro assay, the chemical (MCI, CAS No. 26172-55-4) was found to be highly reactive towards glutathione, histidine and lysine and formed stable adducts (CIR, 2010).

A modified Buehler guinea pig maximisation test using Dunkin-Hartley guinea pigs found the chemical (MCI) to be a strong sensitiser at 0.1 %. A re-challenge with the chemical found that 50 % of the animals reacted to a lower concentration of 0.02 % (CIR, 2010).

A local lymph node assay (LLNA) study showed that the chemical (MCI) induced a strong lymph node cell proliferation in mice which correlated with protein binding and a guinea pig sensitisation assay (Potter and Hazelton, 1994). The PC_{200} value (the concentration that produces a two-fold increase in mouse lymph node cell proliferation over controls) was 11 µg. The concentrations required to induce (IC50) and elicit (EC50) a response in 50 % of guinea pigs was 774 and 38 µg, respectively.

In an LLNA study with the analogue chemical (MCI/MI, CAS No. 55965-84-9), EC3 values (an estimated concentration that will induce a stimulation index of 3 following topical application of the chemical) of 0.0082 (in acetone and olive oil vehicle) and 0.063 (propylene glycol vehicle) were determined. The chemical (MCI) was characterised as a strong sensitiser. The data obtained correlated with cytokine profiling indicative of a skin sensitiser (NICNASa).

Observation in humans

MCI has been reported to be an sensitiser in both cosmetic and occupational settings (NICNASa).

Data from multiple research centres conducted between 2010 and 2013 in Europe illustrates a rise in the frequency of sensitisation to the chemical from 4.4 to 8.3 %. Further, other pan-European data conducted between 2006 and 2008 illustrates a high prevalence of sensitisation (approximately 2—2.5 %) in eczema patients (SCCS, 2013).

In a study, 22 patients who were positive for sensitisation to the analogue (MCI/MI) were patch tested with the chemical at 300 ppm and all reacted positively. A follow up study showed that of 12 patients previously sensitised to MCI/MI, all tested positive for the MCI/MI at 150 ppm (SCCS, 2013).

Results from several patch tests indicate that the chemical has a strong potential to cause skin sensitisation and which correlated with the Open Epicutaneous Test (OET) (SCCS, 2013; NICNASa).

Further, patients sensitised to MI also react to MCI while the opposite is not necessarily true (SCCS, 2013).

Airborne allergic contact dermatitis following non-occupational exposures to isothiazolinones in water-based paints has been reported (Lundov et al., 2014; Aerts et al., 2017; Amsler et al., 2017).

Repeated Dose Toxicity

Oral

Based on the available data, the chemical is not considered to cause serious health damage from repeated oral exposure.

No treatment-related effects were observed in rats (Charles River CD) exposed for three months to MCI/MI (up to 800 ppm, equivalent to 29 mg/kg bw/day) in their diet.

In a drinking water study, no signs of adverse effects to any tissues or organs distant from the site of dosing were observed in rats (COBS SD) exposed to up to 225 ppm (20.5 mg/kg bw/day) of MCI/MI for three months.

Dogs fed with diets prepared with MCI/MI for three months showed no signs of systemic toxicity up to the highest tested dose levels of 30 mg/kg bw/day (SCCS, 2013).

Dermal

No data were available for the chemical. Based on the available toxicity study for the analogue chemical (3:1 mixture of methylchloroisothiazolinone and methylisothiazolinone, CAS No. 55965-84-9), in which there was no evidence of dermal toxicity, the chemicals are not considered to cause serious damage to health from repeated exposure through this route (NICNASa).

Inhalation

No data were available for the chemical. Based on the available inhalation toxicity study for the analogue chemical (3:1 mixture of methylchloroisothiazolinone and methylisothiazolinone, CAS No. 55965-84-9), in which there was no evidence of inhalation toxicity, the chemicals are not considered to cause serious damage to health from repeated exposure through this route (NICNASa).

Genotoxicity

Based on the weight of evidence from available in vitro and in vivo genotoxicity studies the chemical is not considered to be genotoxic (CIR, 1992; NICNASa; SCCS, 2009).

The genotoxic potential of MCI was evaluated in several Ames (reverse mutation) tests with *Salmonella typhimurium* strains TA1535, TA1537, TA98 and TA100. The chemical was mutagenic in the strain TA100 only without metabolic activation. MCI/MI (CAS No. 55965-84-9) was mutagenic to strain TA100 and *Escherichia coli* in the Ames test. MCI/MI also resulted in an increase in the mutant frequency in two gene mutation tests (mouse lymphoma cell line) both in the absence and presence of metabolic activation. An in vitro unscheduled DNA synthesis (UDS) assay using primary rat hepatocytes treated with MCI/MI was negative. MCI/MI showed no clastogenic activity when evaluated in an in vitro chromosome aberration test using Chinese hamster lung cells.

MCI/MI in vitro studies yielded positive results that in vivo tests did not confirm. MCI/MI showed negative results in micronucleus tests (mouse), chromosome aberration tests (mouse and rats), sex-linked recessive lethal tests in *Drosophila Melanogaster* and in two UDS studies in the rat.

Based on results from negative in vivo mutagenicity studies, along with negative carcinogenicity study for the analogue, the chemical is not considered to be genotoxic.

Carcinogenicity

No data were available for the chemical. The weight of evidence from the available carcinogenicity study for the analogue chemical—3:1 mixture of methylchloroisothiazolinone and methylisothiazolinone (MCI/MI, CAS No. 55965-84-9)—indicates there was no evidence of carcinogenicity. As this analogue contains MCI at high concentrations, it also is not likely to be a carcinogen (NICNASa).

Reproductive and Developmental Toxicity

No data were available for chemicals. The weight of evidence from the available studies for the analogue chemical (MCI/MI, CAS No. 55965-84-9) indicates that the chemicals are not a specific reproductive or developmental toxin. As this analogue contains MCI at high concentrations, it also is not likely to be a reproductive or developmental toxin.

In a two-generation reproductive toxicity study, no treatment-related effects were noted in rats (Crl:CD BR strain) exposed to MCI/MI in drinking water (up to 300 ppm). A no observed adverse effect level (NOAEL) of 30 ppm was determined based on gastric irritation of the stomach at higher doses. The no observed effect level (NOEL) for reproductive toxicity was 300 ppm (the highest dose tested). There were no effects on fertility or foetal developmental parameters at any dose tested (SCCS, 2009).

Several teratogenicity studies showed no treatment-related effects in rats and rabbits exposed to MCI/MI. Pregnant rabbits administered with MCI/MI by gavage up to doses of 13.3 mg/kg bw/day, showed maternal toxicity at all doses. No visceral or skeletal malformations were found in the foetuses at any dose level. Pregnant Sprague Dawley (SD) rats exposed to MCI/MI by gavage (up to 15 mg/kg bw/day) showed maternal toxicity at all dose levels. Based on the absence of any treatment-related effects on surviving dams and foetuses, a developmental NOEL of 15 mg/kg bw/day was determined (CIR, 1992; SCCS, 2009).

Risk Characterisation

Critical Health Effects

The critical health effect for risk characterisation includes systemic acute toxcity (by all route of exposure) and local effect (skin sensitisation). The chemical may also cause skin corrosion and possibly serious eye damage.

Public Risk Characterisation

The available information indicates that the chemical is widely used in Australia as a preservative in cosmetic, personal care (including baby products), cleaning and laundry products. The chemical has also been reported to have domestic use as a preservative in paint formulations. The chemical is reported to be used in cosmetic/domestic products overseas at concentrations up to 0.1 % (HHPD).

Considering the range of cosmetic and personal care products that could contain the

chemical, the main route of public exposure is expected to be through the skin and inhalation from products applied as aerosols, and incidental oral exposure. Given the low concentrations expected for a preservative in these products, health effects apart from skin sensitisation are not expected.

Direct exposure to paint formulations containing the chemical and several other isothiazolinones have resulted in allergic reactions (see **Skin sensitisation: Observation in humans** section). Currently, there are no restrictions in Australia on using the chemical and several other isothiazolinones in paint formulations. Further characterisation of the risks from the use of the chemical and other isothiazolinones as a preservative in water-based paint formulations should be examined. In the absence of any regulatory controls, the characterised critical health effect of skin sensitisation has the potential to pose an unreasonable risk when used as a preservative in paint formulations.

Occupational Risk Characterisation

During product formulation, dermal, ocular and inhalation exposure of workers to the chemical may occur, particularly where manual or open processes are used. These may include transfer and blending activities, quality control analysis, and cleaning and maintaining of equipment. Worker exposure to the chemical at lower concentrations can also occur while using formulated products containing the chemicals. The level and route of exposure will vary depending on the method of application and work practices employed.

Given the critical systemic acute and local health effects, the chemical could pose an unreasonable risk to workers unless adequate control measures to minimise dermal, ocular and inhalation exposure to the chemical are implemented. The chemical should be appropriately classified and labelled to ensure that a person conducting a business or undertaking (PCBU) at a workplace (such as an employer), has adequate information to determine appropriate controls.

NICNAS Recommendation

The chemical is recommended for Tier III assessment to further characterise the risks from its use in domestic products. The Tier III assessment would consider the risks and appropriate concentration limits to manage the risks from the use of the chemical and other isothiazolinones as preservatives in paint formulations.

Regulatory Control

Public Health

Products containing the chemical should be labelled in accordance with state and territory legislation (SUSMP, 2019). The need for further regulatory control for public health will be determined as part of the Tier III assessment.

Work Health and Safety

The chemical is classified as hazardous for human health in the Hazardous Chemicals Information System (HCIS) (Safe Work Australia).

Note that the classification below was based on the recommended amendment to the hazard classification in the HSIS (Hazardous Substance Information System—the Safe Work Australia online classification database at that time) from the IMAP assessment published in Tranche 9, as discussed in the **Health Hazard Information** section of this report.

This updated assessment report does not change the recommended classifications (see Existing Work Health and Safety Controls). This assessment does not consider classification of physical hazards and environmental hazards.

Hazard	Approved Criteria (HSIS)[a]	GHS Classification (HCIS)[b]
Acute Toxicity	Not Applicable	Toxic if swallowed - Cat. 3 (H301) Toxic in contact with skin - Cat. 3 (H311) Fatal if inhaled - Cat. 2 (H330)
Irritation / Corrosivity	Not Applicable	Causes severe skin burns and eye damage - Cat. 1B (H314)
Sensitisation	Not Applicable	May cause an allergic skin reaction - Cat. 1 (H317)

[a] Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)].

[b] Globally Harmonized System of Classification and Labelling of Chemicals (GHS) United Nations, 2009. Third Edition.

[*] Existing Hazard Classification. No change recommended to this classification

Advice for consumers

Products containing the chemical should be used according to the instructions on the label.

Advice for industry

Control measures

Control measures to minimise the risk from oral, dermal, ocular, and inhalation exposure to the chemical should be implemented in accordance with the hierarchy of controls. Approaches to minimise risk include substitution, isolation and engineering controls. Measures required to eliminate or minimise risk arising from storing, handling and using a hazardous chemical depend on the physical form and the manner in which the chemicals are used. Examples of control measures which may minimise the risk include, but are not limited to:

- using closed systems or isolating operations;
- using local exhaust ventilation to prevent the chemical from entering the breathing zone of any worker;
- health monitoring for any worker who is at risk of exposure to the chemical if valid techniques are available to monitor the effect on the worker's health;
- air monitoring to ensure control measures in place are working effectively and continue to do so;
- minimising manual processes and work tasks through automating processes;
- work procedures that minimise splashes and spills;
- regularly cleaning equipment and work areas; and
- using protective equipment that is designed, constructed, and operated to ensure that the worker does not come into contact with the chemical.

Guidance on managing risks from hazardous chemicals are provided in the *Managing risks of hazardous chemicals in the workplace—Code of practice* available on the Safe Work Australia website.

Personal protective equipment should not solely be relied upon to control risk and should only be used when all other reasonably practicable control measures do not eliminate or sufficiently minimise risk. Guidance in selecting personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

Obligations under workplace health and safety legislation

Information in this report should be taken into account to assist with meeting obligations under workplace health and safety legislation as adopted by the relevant state or territory. This includes, but is not limited to:

- ensuring that hazardous chemicals are correctly classified and labelled;
- ensuring that (material) safety data sheets ((m)SDS) containing accurate information about the hazards (relating to both health hazards and physicochemical (physical) hazards) of the chemicals are prepared; and
- managing risks arising from storing, handling and using hazardous chemicals.

Your work health and safety regulator should be contacted for information on the work health and safety laws in your jurisdiction.

Information on how to prepare an (m)SDS and how to label containers of hazardous chemicals are provided in relevant codes of practice such as the *Preparation of safety data sheets for hazardous chemicals— Code of practice* and *Labelling of workplace hazardous chemicals—Code of practice*, respectively. These codes of practice are

available from the Safe Work Australia website.

A review of the physical hazards of the chemical has not been undertaken as part of this assessment.

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